

What is claimed:

1. A host-vector system, which comprises
 - a. A host chromosome comprising
 - i. An activatable control sequence, wherein the activatable control sequence is activatable by an inducer;
 - ii. a sequence that encodes a repressor, wherein the sequence is operably-linked to the activatable control sequence; and
 - iii. at least one essential gene, wherein the essential gene encodes a polypeptide that is necessary for synthesis of a rigid layer of a cell wall of a prokaryote, and wherein the essential gene is inactivated;
 - AND
 - b. A vector comprising
 - i. a eukaryotic expression cassette comprising
 1. A eukaryotic promoter sequence;
 2. A site for insertion of a gene encoding a desired gene product;
 - and
 3. A polyadenylation sequence;
 - ii. a prokaryotic activator-promoter sequence;
 - iii. at least one origin of replication (ori);
 - iv. a regulatable prokaryotic promoter, which is repressible by the repressor;
 - v. at least one essential gene, wherein the essential gene is necessary for synthesis of a rigid layer of a cell wall of a prokaryote;
 - vi. at least one transcription terminator sequence; and
 - vii. at least one CpG sequence motif, wherein the CpG sequence motif enhances immunogenicity.
2. A host-vector system, which comprises
 - a. A host chromosome comprising

- i. An activatable control sequence, wherein the activatable control sequence is activatable by an inducer;
- ii. at least one sequence that encodes a repressor, wherein the sequence is operably-linked to the activatable control sequence; and
- iii. at least one essential gene, wherein the essential gene encodes a polypeptide that is necessary for synthesis of a rigid layer of a cell wall of a prokaryote, and wherein the essential gene is operably linked to the activatable control sequence;

AND

- b. A vector comprising
 - i. a eukaryotic expression cassette comprising
 - 1. a eukaryotic promoter sequence;
 - 2. a site for insertion of a gene encoding a desired gene product; and
 - 3. a polyadenylation sequence;
 - ii. a prokaryotic activator-promoter sequence;
 - iii. at least one origin of replication (ori);
 - iv. a regulatable prokaryotic promoter sequence, wherein the regulatable prokaryotic promoter sequence is repressible by the repressor;
 - v. at least one essential gene, wherein the essential gene is necessary for synthesis of a rigid layer of a cell wall of a prokaryote;
 - vi. at least one transcription terminator sequence; and
 - vii. at least one CpG sequence motif, wherein the CpG sequence motif enhances immunogenicity.
- 3. A host-vector system, which comprises
 - a. A host chromosome comprising
 - i. A first activatable control sequence, wherein the first activatable control sequence is activatable by a first inducer;

- ii. at least one sequence that encodes a repressor, wherein the sequence is operably-linked to the first activatable control sequence; and
- iii. at least one essential gene, wherein the essential gene encodes a polypeptide that is necessary for synthesis of a rigid layer of a cell wall of a prokaryote, wherein the essential gene is operably linked to a second activatable control sequence, and wherein the second activatable control sequence is activatable by a second inducer;

AND

- b. A vector comprising
 - i. a eukaryotic expression cassette comprising
 - 1. a eukaryotic promoter sequence;
 - 2. a site for insertion of a gene encoding a desired gene product; and
 - 3. a polyadenylation sequence;
 - ii. a prokaryotic activator-promoter sequence;
 - iii. at least one origin of replication (ori);
 - iv. a regulatable prokaryotic promotor sequence, wherein the regulatable prokaryotic promotor sequence is repressible by the repressor;
 - v. at least one essential gene, wherein the essential gene is necessary for synthesis of a rigid layer of a cell wall of a prokaryote;
 - vi. at least one transcription terminator sequence; and
 - vii. at least one CpG sequence motif, wherein the CpG sequence motif enhances immunogenicity.

4. A host-vector system, which comprises

- a. A host chromosome comprising
 - i. an activatable control sequence, wherein the activatable control sequence is activatable by an inducer;

- ii. at least one sequence that encodes a repressor, wherein the sequence is operably-linked to the activatable control sequence; and
- iii. at least one essential gene, wherein the essential gene encodes a polypeptide that is necessary for synthesis of a rigid layer of a cell wall of a prokaryote, and wherein the essential gene is inactivated;

AND

- b. At least one vector comprising
 - i. a prokaryotic activator-promoter sequence;
 - ii. at least one origin of replication (ori);
 - iii. a first regulatable prokaryotic promotor sequence, wherein the first regulatable prokaryotic promotor sequence is repressible by a first repressor;
 - iv. a second regulatable prokaryotic promotor sequence, wherein the second regulatable prokaryotic promotor sequence is repressible by a second repressor;
 - v. at least one essential gene, wherein the essential gene is necessary for synthesis of a rigid layer of a cell wall of a prokaryote;
 - vi. at least one transcription terminator sequence; and
 - vii. a site for insertion of a gene encoding a desired gene product.

5. A host-vector system, which comprises

- a. A host chromosome comprising
 - i. an activatable control sequence, wherein the activatable control sequence is activatable by an inducer;
 - ii. a sequence that encodes a repressor, wherein the sequence is operably-linked to the activatable control sequence; and
 - iii. at least one essential gene, wherein the essential gene encodes a polypeptide that is necessary for synthesis of a rigid layer of a cell

wall of a prokaryote, and wherein the essential gene is operably linked to the activatable control sequence;

AND

- b. At least one vector comprising
 - i. a prokaryotic activator-promoter sequence;
 - ii. at least one origin of replication (ori);
 - iii. a first regulatable prokaryotic promotor sequence, wherein the first regulatable prokaryotic promotor sequence is repressible by a first repressor;
 - iv. a second regulatable prokaryotic promotor sequence, wherein the second regulatable prokaryotic promotor sequence is repressible by a second repressor;
 - v. at least one essential gene, wherein the essential gene is necessary for synthesis of a rigid layer of a cell wall of a prokaryote;
 - vi. at least one transcription terminator sequence; and
 - vii. a site for insertion of a gene encoding a desired gene product.
- 6. A host-vector system, which comprises
 - a. A host chromosome comprising
 - i. A first activatable control sequence, wherein the first activatable control sequence is activatable by a first inducer;
 - ii. at least one sequence that encodes a repressor, wherein the sequence is operably-linked to the first activatable control sequence; and
 - iii. at least one essential gene, wherein the essential gene encodes a polypeptide that is necessary for synthesis of a rigid layer of a cell wall of a prokaryote, wherein the essential gene is operably linked to a second activatable control sequence, and wherein the second activatable control sequence is activatable by a second inducer;

AND

- b. At least one vector comprising
 - i. a prokaryotic activator-promoter sequence;
 - ii. at least one origin of replication (ori);
 - iii. a first regulatable prokaryotic promotor sequence, wherein the first regulatable prokaryotic promotor sequence is repressible by a first repressor;
 - iv. a second regulatable prokaryotic promotor sequence, wherein the second regulatable prokaryotic promotor sequence is repressible by a second repressor;
 - v. at least one essential gene, wherein the essential gene is necessary for synthesis of a rigid layer of a cell wall of a prokaryote;
 - vi. at least one transcription terminator sequence; and
 - vii. a site for insertion of a gene encoding a desired gene product.
- 7. A host-vector system, which comprises
 - a. A host chromosome comprising
 - i. An activatable control sequence, wherein the activatable control sequence is activatable by an inducer;
 - ii. a sequence that encodes a repressor, wherein the sequence is operably-linked to the activatable control sequence; and
 - iii. two different essential genes, wherein the essential genes encode polypeptides that are necessary for synthesis of a rigid layer of a cell wall of a prokaryote, and wherein the essential genes are inactivated, operably linked to an the activatable control sequence, or both;
 - b. A first vector comprising
 - i. a eukaryotic expression cassette comprising
 - 1. A eukaryotic promoter sequence;
 - 2. A site for insertion of a gene encoding a desired gene product; and
 - 3. A polyadenylation sequence;

- ii. a prokaryotic activator-promoter sequence;
- iii. at least one origin of replication (ori);
- iv. a regulatable prokaryotic promoter, which is repressible by the repressor;
- v. an essential gene, wherein the essential gene is necessary for synthesis of a rigid layer of a cell wall of a prokaryote;
- vi. at least one transcription terminator sequence; and
- vii. at least one CpG sequence motif, wherein the CpG sequence motif enhances immunogenicity,

AND

- c. A second vector comprising
 - i. a prokaryotic activator-promoter sequence;
 - ii. at least one origin of replication (ori);
 - iii. a first regulatable prokaryotic promoter sequence, wherein the first regulatable prokaryotic promoter sequence is repressible by a first repressor;
 - iv. a second regulatable prokaryotic promoter sequence, wherein the second regulatable prokaryotic promoter sequence is repressible by a second repressor;
 - v. at least one essential gene, wherein the essential gene is necessary for synthesis of a rigid layer of a cell wall of a prokaryote;
 - vi. at least one transcription terminator sequence; and
 - vii. a site for insertion of a gene encoding a desired gene product.
- 8. The host-vector system of claim 4, 5, or 6, wherein the host-vector system comprises two vectors, and wherein the desired gene product and the essential gene on one vector is different from the desired gene product and the essential gene on the other vector.
- 9. The host-vector system of claims 7, wherein the host-vector system comprises two vectors, and wherein the desired gene product and the essential gene on the

first vector is different from the desired gene product and the essential gene on the second vector.

10. The host-vector system of claim 1, 2, 3, 4, 5, 6, or 7, further comprising a gene encoding a desired gene product.
11. The host-vector system of claim 10, wherein the gene encodes an antigen.
12. The host-vector system of claim 11, wherein the antigen is from a bacterial, viral, fungal, or parasitic pathogen.
13. The host-vector system of claim 12, wherein the antigen is from *Eimeria*, HBV, or *streptococcus pneumoniae*.
14. A microorganism comprising the host-vector system of claim 1, 2, or 3.
15. A microorganism comprising the host-vector system of claim 4, 5, or 6.
16. A microorganism comprising the host-vector system of claim 7.
17. A vaccine comprising the microorganism of claim 14.
18. A vaccine comprising the microorganism of claim 15.
19. A vaccine comprising the microorganism of claim 16.
20. A method for delivery of a nucleic acid vector to a eukaryotic host, which comprises administering to the eukaryotic host a microorganism of claim 14, wherein the eukaryotic host expresses the desired gene product.

21. A method for delivery of a desired gene product to a eukaryotic host, which comprises administering to the eukaryotic host a microorganism of claim 15, wherein a prokaryote expresses the desired gene product.
22. A method for delivery of a nucleic acid vector and a desired gene product to a eukaryotic host, which comprises administering to the eukaryotic host a microorganism of claim 16, wherein both the eukaryotic host expresses the desired gene product from the first vector and a bacterial host express the desired gene product from the second vector.
23. The host-vector system of claim 1, wherein the eukaryotic promoter is CMV.
24. The host-vector system of claim 1, wherein the prokaryotic activator-promoter sequence is araC P_{BAD}.
25. The host-vector system of claim 1, wherein the *ori* is pUC, pBR, p15A, pSC101, pBAC.
26. The host-vector system of claim 25, wherein the *ori* is pUC.
27. The host-vector system of claim 1, wherein the regulatable control sequence is P22 P_R or P_{trc}.
28. The host-vector system of claim 27, wherein the regulatable control sequence is P22 P_R.
29. The host-vector system of claim 1, wherein the repressor is C2, Lac I, or both.
30. The host-vector system of claim 29, wherein the repressor is C2.

31. The host-vector system of claim 1, 2, 3, 4, 5, 6, or 7, wherein the essential gene is *asd*, *murA*, *dapA*, or *alr*.
32. The host-vector system of claim 1, 2, 3, 4, 5, 6, or 7, wherein the essential gene has a mutation that changes an ATG start codon to GTG or TTG.
33. The host-vector system of claim 1, 2, 3, 4, 5, 6, or 7, wherein the terminator sequence is rrFG.
34. The host-vector system of claim 1, 2, 3, 4, 5, 6, or 7, comprising at least three terminator sequences.
35. The host-vector system of claim 1, 2, 3, 4, 5, or 6, comprising at least two essential genes.
36. The host-vector system of claim 1, 2, 3, or 7, wherein the CpG sequence motif is GTCGTT, GACGTT, GACGTC, AACGTT, or AGCGCT.
37. The host-vector system of claim 1, 2, 4, 5, 6, or 7, wherein the inducer is arabinose.
38. The host-vector system of claim 3, wherein the first inducer and second inducer are arabinose.
39. The method of claim 20, 21, or 22, wherein the eukaryotic host is a vertebrate.
40. The method of claim 39, wherein the vertebrate is a human, mouse, rat, or bird.
41. The method of claim 20, 21, or 22, wherein the microorganism colonizes a lymphoid tissue of the eukaryotic host.

42. The method of claim 41, wherein the lymphoid tissue is in a liver, spleen, GALT, or mesenteric lymph node.
43. The host-vector system of claim 1, 2, 3, 4, 5, 6, or 7, further comprising a mutation in a gene to enhance immunogenicity, wherein the mutation is *ΔendA2311*, *ΔrelA1123*, *ΔaraE25*, *ΔaraBAD1923*, *ΔaraBAD23*, *Δgmd-11*, or *Δgmd-fcl-26*.
44. A method of immunizing a poultry against coccidiosis, comprising
 - a. Administering to the poultry a microorganism comprising the host-vector system of claim 11, wherein the antigen is from *Eimeria*; and
 - b. Eliciting an immune response in the poultry.
45. The method of claim 44, wherein the poultry is a chicken.
46. The vaccine of claim 17, 18, or 19, wherein the vector is a BAC vector.